



OREGON DEPARTMENT OF
ENERGY

Employment Assessment of the Oregon RPS

August 2011

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Executive Summary

Oregon has implemented significant policies that call for sizeable investments in developing the state's renewable energy resources and decreasing fossil fuels usage.

In 2007, the legislature passed Senate Bill 838 (SB 838) to encourage the development of new renewable energy sources and decrease utilities' use of fossil fuels for electricity generation. SB 838 created the Oregon Renewable Portfolio Standard (RPS), requiring large utilities to provide 25 percent of their retail electricity sales from renewable energy sources by 2025.

The legislation also requires the Oregon Department of Energy (ODOE) to evaluate the impact of the legislation on employment in the state in the renewable energy sector. The study "shall assess the number of new jobs created in the renewable energy sector in this state and the average wage rates and the provision of health care and other benefits for those jobs."¹ ODOE is also required to investigate the availability of training opportunities that would prepare the workforce for positions in the renewable sector.

This assessment provides information on employment in Oregon at RPS eligible electricity generating facilities. A growing body of evidence indicates that RPS eligible projects have increased Oregon's renewable sector employment. Also, this assessment found a broad range of programs that are available to train and prepare employees for work in the renewable energy sector.

In addition to employment findings, this study highlights the need for continued enhancement of renewable sector assessments. Below are recommendations, some of which are already being pursued to increase the understanding of the Oregon RPS impact on employment and to the precision of future reports:

- Increase interagency and stakeholder cooperation on employment studies.
- Enhance employment-related reporting in agency-supported projects receiving state incentives.
- Request employment-related information on projects seeking Oregon RPS certification.

ODOE also recommends future consideration of an economic impact analysis of the RPS. Such an assessment would provide information on employment and RPS-related market impacts and would help policymakers and stakeholders identify strengths as well as areas where the program can be better tailored to achieve its desired policy goals.

¹ Oregon Laws 2007, Section 25, Chapter 301.

Overview

This report addresses renewable energy sector employment related to the Oregon RPS. The report consists of four primary sections. The first section provides an overview of the statutory framework of the Oregon RPS. Included in this section is a discussion of RPS beginnings, including a summary of key legislation that amended the RPS and programs that complement the Oregon RPS's effects on employment.

The second section of the report provides a review of employment in the larger green sector as well as other studies on the renewable sector.² The report provides appropriate context for understanding the relative size of Oregon's renewable industry.

The third section of this report discusses the results of the assessment. It includes results from an ODOE survey of eligible facilities, employment estimates provided to the Oregon Energy Facility Siting Council (EFSC), and a collection of case studies that document job creation in specific segments of the renewable sector.³

The final section of the report outlines ODOE's current and future efforts to collect data on renewable sector employment. ODOE has already taken steps to increase reporting requirements.

I. Overview: Oregon's Renewable Portfolio Standard (RPS)

Background

In 2005, Oregon's Renewable Energy Action Plan (REAP) prepared for then-Governor Ted Kulongoski by ODOE, recommended that Oregon conduct a feasibility assessment of the renewable portfolio standard,⁴ a year before the Governor's Advisory Group on Global Warming called for the establishment of a RPS. Then and now, RPS programs were viewed as an effective policy initiative that could encourage increased renewable energy development.⁵

To establish a basic framework for an Oregon RPS and develop other goals identified by the REAP, ODOE organized and staffed a broad-based stakeholder group known as the Renewable Energy Working Group

² The terms *green economy* or *green job* do not have a uniform definition. The Oregon Employment Department defines a green job as one that provides a service or produces a product in: 1) Increasing energy efficiency; 2) Producing renewable energy; 3) Preventing, reducing or mitigating environmental degradation; 4) Cleaning up and restoring the natural environment; and 5) Providing education, consulting, policy promotion, accreditation, trading and offsets, or similar services supporting categories 1-4.

³ An initial draft of this report included self-reported employment estimates from applicants for renewable energy Business Energy Tax Credits (BETC). These estimates were retrieved from projects that had received a preliminary BETC certification but had yet to complete the project. Survey of RPS eligible and operational projects provides more accurate, if anecdotal data.

⁴ Oregon's Renewable Energy Action Plan, Prepared by the Oregon Department of Energy for Governor Ted Kulongoski. April 12, 2005.

⁵ In 2007 when Oregon passed RPS legislation 20 other states had already established RPS guidelines. Currently, 34 states including the District of Columbia, have established RPS programs.

(REWG). The REWG first met in February 2006 with a major task: to develop an Oregon RPS or alternative method to speed the transition to renewable energy for electricity generation.

The REWG developed a legislative framework for a state RPS, which would later be expanded and adopted by the Oregon legislature.

Statutory framework

The Oregon RPS was established in 2007 through Senate Bill 838. The bill directs Oregon utilities to meet a specific percentage of their retail electricity needs with electricity produced from qualified renewable resources. For Oregon's largest utilities (Portland General Electric, PacifiCorp and the Eugene Water and Electric Board), the standard is implemented in stages: 5 percent required in 2011, 15 percent in 2015, 20 percent in 2020, and 25 percent in 2025. Other electric utilities in the state, depending on size, must meet 5 percent or 10 percent by 2025.⁶

Eligible resources include biomass, geothermal, solar, wind, hydropower, ocean thermal, tidal, wave, and hydrogen (if produced from any of these sources). Renewable energy facilities generally must have commenced operating on or after January 1, 1995, with exceptions. Biomass and hydropower facilities are further limited by the specific fuel or environmental impact of the facility. Some solar projects are eligible for a Renewable Energy Certificate (REC) with double value to an Oregon investor-owned utility. This double value for certain solar projects, as well as the addition of municipal solid waste in limited quantities as an eligible resource, are additions to the original RPS (added in 2009 and 2010 legislative sessions, respectively).

To comply with the RPS, utilities are required to retain and retire the RECs associated with the renewable energy claimed for the RPS. RECs—referred to as Green Tags—are tradable commodities which prove that at least 1 Megawatt Hour (MWh) of electricity was produced by a qualifying renewable energy source.⁷ In order for a REC to be considered qualifying energy for Oregon RPS compliance, the energy associated with that REC must meet the standards established by the legislature and receive approval from ODOE.

Key Oregon Energy Legislation and Programs

The Oregon RPS is only one of a slate of programs and policies enacted in Oregon that promote the growth and development of the renewable energy sector. Given the abundance of incentives for renewable energy projects in the state, it is difficult to determine the degree in which the RPS

⁶ Utility size is determined based upon a utility's share of statewide electricity sales. Utilities that deliver three percent or more of the state's electricity load are considered large utilities. Utilities that serve between 1.5 and 2 percent of the state's electricity load must meet the ten percent target, and utilities that have sales of less than 1.5 percent of state sales must meet the five percent threshold.

⁷ The demand and fungibility of RECs has created a market dynamic that places a premium on energy produced from renewable resources. This premium is intended to spur investment in the development of renewable energy facilities.

incentivized the development of a project. Below is a list of programs and projects that either amended the original RPS or complemented its influence on developing Oregon's renewable energy projects.

Business Energy Tax Credit (BETC) – Until recently tax credits for renewable resources were available for up to 50 percent of eligible project costs. Conservation projects could qualify for BETCs up to 35 percent of eligible project costs. The BETC program was created in 1979 and has been modified by the legislature a number of times. In 2011, the legislature completely redesigned the BETC program (HB 3672), reducing tax credits for renewable generation projects.

Community Renewable Energy Feasibility Fund (CREFF) – Grant program that funds feasibility studies for renewable energy, heat, and fuel projects in Oregon.

Small-Scale Energy Loan Program (SELP) – Provides low interest rate loans to projects that save energy, produce energy from renewable projects, use recycled materials to create products, and use alternative fuels. SELP made its first loan in 1981.

Energy Trust of Oregon – Provides cash incentives and technical assistance to energy conservation and renewable energy projects.

Biomass Producer or Collector Tax Credit – Provides tax credit for the collection or production of biomass that is used for energy production. Passed in 2007 (HB 2210) and amended in 2009 (HB 2078) and 2011 (HB 3672).

Key Legislation

Senate Bill 838 (2007) – Created the Oregon Renewable Portfolio Standard, which requires large utilities to provide 25 percent of their retail sales electricity from new renewable energy sources by 2025.

House Bill 2626 (2009) – A low-cost voluntary loan program that can be applied to weatherization of existing homes or businesses or producing renewable energy.

House Bill 3039 (2009) – Creates a solar feed-in tariff pilot program in Oregon. The program requires Oregon's investor owned utilities to cumulatively purchase at least 20 MW of energy from solar photovoltaic facilities. Qualifying facilities must have a capacity of greater than 500kw, but no greater than 5 MW. Each Renewable Energy Certificate (REC) created from a facility located in Oregon receives double credit for RPS compliance.

House Bill 3633 (2010) – Amends the Oregon RPS to emphasize the importance of community renewable energy projects from marine renewable energy sources. Requires the *Department of Land Conservation and Development* to conduct a study on developing commercially viable marine renewable energy.

House Bill 3649 (2010) – Amends the Oregon RPS to allow energy from non-utility owned hydroelectric generation facilities constructed prior to 1995 to qualify if certified as low-impact hydropower.

House Bill 3674 (2010) – Amends the Oregon RPS to allow energy from biomass and municipal solid waste (MSW) facilities constructed prior to 1995. Some restrictions exist.

House Bill 3691 (2010) – Amends the Oregon RPS to include above market costs as an item utilities are allowed to pursue rate recovery through electric utility rates.

Key Federal and Regional Programs and Incentives

The growth of renewable energy in Oregon must be viewed within a federal and regional government context. Project developers consider the potential benefit of cash and tax incentives, voluntary market opportunities, and compliance obligations in multiple states when making a decision to develop a project. A major federal incentive for the development of renewable projects is the federal Investment Tax Credit (ITC). Projects that receive an ITC can receive a credit for up to 30 percent of the project cost. Federal stimulus legislation allowed the ITC to also be taken as a cash grant, which some Oregon wind farms have done.

Regionally the market is heavily influenced by Washington and California. In Washington, several incentives are offered to promote the growth of renewable energy. Included are production payments to those who generate power using solar, wind, or anaerobic digesters and a state Renewable Energy Standard that sets renewable generation targets similar, but less stringent, than Oregon.

The largest regional influence on the renewable energy market comes from California, who hosts the nation's most aggressive RPS program. Recently, California increased its RPS requirements, ordering utilities to produce 33 percent of their power from renewable sources by 2020. An example of California's influence is the Shepherds Flat Wind Farm located near Arlington, Oregon. Shepherds Flat, currently under construction as three separate projects, is set to have a capacity of over 900 MW. Although Shepherds Flat will produce jobs in Oregon, all of the power generated by the facility will be sent to serve Southern California Edison customers. These regional influences combine with Oregon incentives to create an overall regional market environment supportive of the development of renewable projects.

II. Placing the Renewable Sector in Context

Employment in the Green Economy

While the renewable sector in Oregon lacks comprehensive assessments of employment, a considerable amount of analysis has been done on employment in Oregon's green

Measures of Employment

Full Time Equivalent – A measure of employment that creates a ratio based off of the total hours worked in a time period by the total hours available working hours. A .5 FTE would only work half the available working hours.

Job Years – A measure of employment capturing the number of years of employment created and not the number of workers employed. Fifteen job years could be one worker for 15 years, or 5 workers for 3 years apiece.

Jobs – A measure of employment that counts the number of people employed and is less concerned with the amount of time employed. Fifteen jobs could mean 10 jobs for two years and 5 jobs for six months.

economy. These studies highlight the challenges associated with measuring employment in an emerging sector, provide a reference for assessing renewable sector jobs in Oregon, and help to provide context for renewable sector employment.

The first three studies offer specific information that highlights the growing role of green or clean energy jobs in Oregon's labor market. Two are national and regional assessments; one is a state level assessment that focuses on the green economy and also offers indication of job growth in Oregon's renewable energy sector.

First, *The Clean Energy Economy*, a comparative, independent analysis released in June 2009 by the Pew Charitable Trusts establishes an initial reference mark for employment in Oregon's renewable energy sector. The report identifies 19,340 total jobs in the state's Clean Energy Economy; of those 1,083 are in the Oregon's clean energy sector.⁸

This aligns well with the Oregon RPS as they both focus on newer projects that use renewable energy resources. What denotes a "small-scale" bio-power project, however, should be clarified. Jobs associated with new hydropower projects which are not certified as low-impact will be excluded from the Pew count, which could result in a minor error because the Oregon RPS allows newer hydro projects with some limitations.⁹ "Newer" generating facilities in the Oregon RPS are generally those facilities that began to operate or increased annual output after 1994.¹⁰

In 2010, the Brookings Metropolitan Policy Program conducted a national and regional assessment of the green jobs economy.¹¹ The study estimated 3.4 percent (58,735) of the state's economy consisted of green economy jobs. The study did not indicate renewable sector jobs specifically. Nearly half of the state's green economy jobs are located in the Portland metropolitan area, with employment in the solar thermal segment of the green economy listed as one of the fastest growing segments of the green economy.

The total number of individuals found to be employed in the green economy by Brookings closely mirrors a 2008 report produced by the Oregon Employment Department (OED). In that report OED conducted a statewide survey of Oregon businesses to estimate the number of "green" jobs in Oregon and to gather information for workforce and training purposes. Their findings were published in *The Greening of Oregon's Workforce: Jobs, Wages and Training*. The report estimates that in 2008 over

⁸ PEW identifies five sectors of the clean energy economy. Of those five sectors, the clean energy sector is seen as closely aligning with Oregon's RPS.

⁹ Post-1994 hydropower projects are not eligible if located inside "any protected area designated by the Pacific Northwest Electric Power and Conservation Planning Council . . . or any area protected under the federal Wild and Scenic Rivers Act . . . or the Oregon Scenic Waterways act." See ORS 469A.025(4)(a). There is no requirement that new hydropower facilities receive low-impact certification in order to be eligible.

¹⁰ The Oregon RPS does allow up to 90 MWa from pre-1995 hydroelectric facilities if the facility is certified low-impact or if the electricity is attributable to efficiency upgrades made on the facility after January 1, 1995. See ORS 469A.020.

¹¹ *Sizing the Clean Economy: A National and Regional Green Jobs Assessment*. The Brookings Institution. July 2010.

5,000 Oregon employers had a total of 51,000 green jobs. The data was not divided into specific green economy sectors, to ascertain the number of renewable energy jobs.

OED's survey focuses on the green economy affected by a transition to green business practices, rather than specific green job sectors. Because of this, the report's employment numbers capture not only wind technicians and solar panel installers, but jobs in food preparation, retail sales, and grounds keeping. The Employment Department defines a green job as one that fits within one of five categories:

1. Increasing energy efficiency
2. Producing renewable energy
3. Preventing, reducing, or mitigating environmental degradation
4. Cleaning up and restoring the natural environment
5. Providing education, consulting, policy promotion, accreditation, trading and offsets, or similar services supporting categories 1-4

As it relates to the RPS renewable energy producing jobs listed in the second category, align with job functions of renewable energy project employees associated with SB 838. Unfortunately the data collected in this survey does not provide enough details to determine what category these employees would be placed.

OED's report highlighted the challenge discussed earlier distinguishing a "green" job from a non-green job given the significant crossover within occupations. While green jobs may be focused on producing a product or providing a service that has environmental benefits, it doesn't appear their job descriptions are much different from non-green counterparts within the same occupation.¹² Similarly, depending on the type of work performed, without a specific description of the employee's job functions, a single individual could be classified into multiple survey categories depending on a survey respondent's understanding of the category. This is a challenge when examining electricians. Depending on the function being performed, these individuals could be placed in the renewable energy category if they are engaged in solar panel installation, or assigned to the energy efficiency category if they are involved in providing residential energy efficiency upgrades.

Employers surveyed did indicate a general belief that they would continue to add green jobs through the next year despite being in the midst of tough economic times. Respondents expect to increase green employment by 14 percent. Construction and extraction job classifications that would include solar panel installers and some wind technicians are expected to grow by seven percent.

While the OED report offers information about the overall Oregon green economy, for the present study's purpose the report's value is limited by the lack of results specific to the renewable energy sector. By comparing OED's report with a report conducted by the State of Washington, a clearer picture emerges as to what portion of the green economy consists of renewable sector jobs.

¹² *The Greening of Oregon's Workforce: Jobs, Wages and Training*. Oregon Employment Department, June 2009, page 6.

Renewable Sector Employment: A View from Other States

A fourth report offers a comparative look at the size of the green jobs sector of Washington State and also provides information specific to the renewable energy sector. From this report some inference can be made as to the size of Oregon's renewable energy employment sector.

In January 2009, Washington State released *Washington State Green Economy Jobs*. This report was the product of a statewide survey of Washington businesses conducted by Washington State University in cooperation with the Employment Security Department and 12 other agencies and businesses. Similar survey methods, combined with the fact that Washington also has renewable energy incentives, including an RPS—makes this survey an appropriate source for comparison.

The Washington State study found that more than 47,000 individuals were employed in the green economy;¹³ a difference of about 4,000 jobs compared to OED's green economy survey results. Washington's survey went one step further than Oregon's survey. It divides the green economy into specific renewable sectors. In the renewable sector identified as renewable energy, Washington found over more than 2,000 renewable energy jobs (4 percent of total green jobs).

A similar study conducted by the State of Michigan found that of the more than 96,000 green sector jobs about 9 percent were in Renewable Energy Production.¹⁴ Together these studies indicate that the renewable energy sector is a small percent of the overall green economy. The Washington study provides a reasonable point of reference for gauging the potential employment size of Oregon's renewable energy sector.

Key Conclusions from Green Economy Assessments

- Reports on employment in the larger green economy, of which the renewable sector is a part, indicate Oregon's green sector has had an impact.
- Assessments of renewable sector employment in other states indicate renewable energy employment accounts for two to nine percent of green sector employment.
- Measurement challenges make it difficult to accurately breakdown segments of the green economy for analysis.

¹³ Washington State Green Economy Jobs, Washington State Employment Security Department, January 2009.

¹⁴ Michigan Green Jobs Report: Occupations and Employment in the New Green Economy. Department of Energy Labor and Economic Growth, May 2009, Page 12.

III. RPS Employment Study

Study Objectives

SB 838 required ODOE to assess the number of new jobs created in the renewable sector, the average wage and benefit rates, and the availability of training opportunities for individuals seeking renewable sector employment. The lack of an existing renewable sector employment baseline estimate and limitations on existing systems for collecting renewable sector employment information hinders ODOE's ability to assess the number of new RPS-stimulated renewable sector jobs. This study utilizes a variety of methods, offering a current assessment of existing renewable sector jobs that can reasonably be linked to the RPS. It also includes a survey to RPS eligible facilities and an analysis of employment estimates provided to the Oregon Energy Facility Siting Council (EFSC) by RPS eligible project developers.

Summary of Findings

- Measurement challenges including the lack of formal categorization of green jobs; lack of standard occupational classifications related to these jobs; and lack of industry specific classifications in the North American Industry Classification System limit the ability to provide a comprehensive estimate of renewable sector employment.
- A survey of Oregon RPS eligible facilities indicate current employment of approximately 82 FTE positions at nine electricity generation facilities located in the state.
- Records from the Energy Facility Siting Council (EFSC) and selected case studies of renewable energy projects in Oregon indicate renewable projects often generate a considerable number of jobs during the construction of the project and maintain relatively small permanent staff to manage and maintain sites. However, companies such as Iberdrola and Vestas have large staffs at their Portland offices.
- Oregon's universities, community colleges, unions, and businesses have partnered on offering a range of training opportunities for individuals seeking employment in the renewable sector.

Measurement Challenges

Several challenges exist that limit the current ability to provide a comprehensive estimate of the effect of SB 838 on renewable sector employment. This includes the lack of an existing baseline; the lack of standard industry codes for individuals working in the renewable sector; the overlap in renewable sector and other traditional sector positions; and the number of state and regional programs that stimulate renewable sector growth. Below is a description of some of the major challenges.

Lack of an Existing Baseline

ODOE's primary mission as an agency has been to promote energy conservation and the growth of clean and affordable energy. As a result, past agency metrics for programs such as tax credits did not focus on economic development measures such as job growth. Recently, ODOE was asked to track economic development data. While ODOE has expanded its efforts to capture metrics related to economic

development there is no historic baseline for the analysis of employment related to energy projects in the state.

Employment Assessment Tools

Employment assessments commonly use national industry and occupation classification systems to analyze employment related data. These systems allow each employee's position to be assigned a specific employment sector and occupation identifier. Traditional industries and areas of employment operate within government-defined sectors and are assigned a specific code identified within the North American Industry Classification System (NAICS). Additional occupations are classified within the Standard Occupational Code (SOC). Using these codes, organizations like the Oregon Employment Department, analyze quarterly unemployment insurance filings that assess employment in established industries and occupations. Renewable energy development is a relatively new sector, which has yet to be given an NAICS definition or code to identify firms operating in the renewable energy sector. The same is true for renewable sector occupations. Without NAICS and SOC codes, performing sector level economic analysis is a challenge.

The lack of sector and occupation specific codes creates a problem when identifying renewable sector employment; therefore, these jobs could be included in traditional occupations. Additionally, a position cannot always be isolated to the renewable sector. For example, positions such as wind turbine technicians¹⁵ are sector specific; however, many others are from traditional job sectors such as electricians, construction workers and engineers involved in the design, construction, installation, and manufacturing associated with a project. This second category of positions can be found in a variety of jobs and cannot be isolated to the renewable sector. Therefore, although SOC codes exist for electricians, engineers and construction jobs, existing data does not differentiate a renewable sector electrician from an electrician working on a variety of projects.

Distinguishing the Impact of the Oregon RPS

It has been difficult differentiating the role Oregon's RPS policy has had on developing Oregon RPS-eligible renewable energy projects that have created employment in the renewable sector. This could be due to Oregon incentives, federal incentives and the regional nature of the renewable sector market.

Development of renewable energy projects depends on multiple factors; therefore, a direct relationship between the Oregon RPS and jobs created by a project is difficult to measure. Renewable project developers consider a host of factors when building a renewable energy project. These include availability of a renewable resource; adequate transmission capacity; interconnection; permitting; federal and state tax incentives; and potential revenue from selling electricity and qualifying Renewable Energy Certificates (RECs).

Additionally, projects developed in Oregon could be eligible other state incentives. Washington, Oregon, California, and the voluntary market offer potential for REC sales and revenue from electricity sales. As

¹⁵ Currently there is no SOC code for wind turbine technician. The Federal Bureau of Labor and Industries has begun the process of developing renewable sector identification codes.

demonstrated by the Shepherds Flat wind farm, facilities located in Oregon can be used to meet other state's RPS requirements. Without conducting a regional scale analysis it is difficult to differentiate the effect various jurisdictions have had on renewable employment in Oregon and the level of impact Oregon's RPS has had on development outside the state.

Employment Assessment Results

Results for this assessment include information gathered through a survey of RPS eligible facilities; employment estimates provided to EFSC; selected case studies of RPS eligible projects, and modeling of employment impacts conducted for the Energy Trust of Oregon; and a review of employment in the manufacturing of renewable generation equipment. The results are described below.

Survey of RPS Eligible Facilities

During the spring of 2011 ODOE sent an electronic survey to account holders representing Oregon RPS eligible facilities.¹⁶ The survey asked facility owners or managers to indicate the number of permanent FTE employed at the facility, wages for positions, and if retirement and health benefits were provided. Additionally, respondents were asked for information on the number of FTE employed during the design, planning, and construction of the facility. Respondents were able to provide information regarding permanent FTE but few provided estimates of the number of FTE employed during project design and development.

ODOE received survey responses from 13 of 33 account holders that received the survey, which represented 72 percent of all Oregon RPS eligible facilities.¹⁷ Account holders did not provide responses for all of their RPS eligible facilities. Oregon RPS eligible facilities reported employing 145.75 FTE. These employment estimates do not include indirect or induced employment at firms located along the supply or consumption chain associated with any project.

Survey analysis focused on responses from RPS eligible facilities that are located in Oregon, commencing operation on or after January 1, 2007.¹⁸ The analysis was further narrowed to the twelve non-solar

¹⁶ Any facility that wants to produce energy considered eligible for the Oregon RPS must register their facility within the Western Renewable Energy Generation Information System (WREGIS) and concurrently, receive approval from ODOE. Account holders may or may not be the facility owner or project developer. 144 facilities have currently registered in WREGIS and received Department approval.

¹⁷ These 13 account holders represent 102 of 141 WREGIS identified facilities that have received Oregon RPS approval. It is common for a project to be divided up into multiple facilities for WREGIS tracking purposes based on phases of development or structural divisions at a facility such as by each hydroelectric turbine.

¹⁸ With certain exceptions, only facilities that commenced operation on or after January 1, 2007 are eligible for the Oregon RPS. Excluding Exelon facilities, which were not able to be contacted for this survey, there are 98 RPS eligible facilities located in Oregon. Of these facilities, 70 began operation on or after January 1, 2007. This study presumes that only those facilities that began operation on or after January 1, 2007 could have been influenced by the RPS.

facilities located in the state.¹⁹ ODOE received surveys from nine out of twelve non-solar facilities surveyed. These results are listed below.

Table 1. Permanent Employment at Certain RPS Eligible Facilities

Renewable Sector	FTE
Wind	70
Biomass	12
Total	82

Source: Oregon Department of Energy

Respondents indicated that operations and maintenance staff dominate permanent positions, with a limited number of administrative and management personal to oversee a facility. Wages and benefits data are provided in a later section.

Solar electric installations account for a majority of RPS eligible Oregon facilities and that began operation on or after January 1, 2007.²⁰ Account holders representing solar installations generally did not offer formal responses to the survey, citing that “these were typically constructed by a developer and do not maintain any permanent staff.”

One respondent that constructed, owns, and operates 15 RPS eligible Oregon solar sites, beginning operations on or after January 1, 2007, offered an overview of employment impacts from their solar installations. At each of these small solar installations,²¹ employment was concentrated during construction, which generally lasted about six weeks. For each project the project owner employed four electricians, four general laborers, a regional operations manager, and one project manager. In addition, a roofing contractor and a concrete contractor were hired, adding an additional one to five workers; the utility receiving the power provided a crew of two to four workers to assist with the project. Continued maintenance requires one employee to cover all installations located in the state.

Growth in the Wind Sector

Much of Oregon’s renewable energy employment comes from the wind industry, which has witnessed tremendous growth over the last decade. Prior to 2007 Oregon was home to six utility-scale wind farms. Since 2007 eleven new commercial wind farms have been constructed, six have undergone expansions, and 19 facilities are currently being developed or are in the planning process. Post-2007 growth in the industry increased commercial wind capacity from 1,055 megawatts to 2,271 megawatts.

¹⁹ No solar facilities formally responded to the survey. Several account holders that own or manage solar facilities indicated to ODOE their facility maintains no FTE and planning and development employment data was unavailable.

²⁰ Of the 60 RPS eligible facilities located in Oregon and that began operations on or after January 1, 2007, 40 are solar facilities.

²¹ Each facility has a nameplate capacity of less than 0.5 megawatts.

Industry and regulatory representatives generally estimate that for every 100 megawatts of wind power installed that 7-10 technicians will need to be employed to maintain the equipment.²² In 2009 Columbia Gorge Community College, the South Central Workforce Council of Washington State, and the Community Renewable Energy Association conducted a needs assessment for wind technicians in Oregon. Interviews with wind farm operators and owners indicated that Oregon facilities employed approximately 225 wind turbine technicians and a small number of supervisory personnel.²³

Records submitted to EFSC further support claims of increased employment from Oregon wind farm development and operation.²⁴ Wind facilities subject to EFSC jurisdiction suggest an increase of 30-40 full-time positions and 350-370 temporary construction positions, since the passage of the Oregon RPS (See Table 1).²⁵ It should be noted that these temporary positions do not necessarily represent net new jobs or unique personnel. Depending on the timing of a project it is possible that construction workers on one project could also have been employed on other wind projects.

Table 2. Commercial Wind Energy Job Creation²⁶

Facility Name	County	Year Generation Commenced	Capacity (MW)	Permanent Jobs	Construction Jobs
Biglow Canyon	Sherman	2010	450	15-20	250
Klondike III	Sherman	2008	300	15-20	100-120
Stateline	Umatilla	2001	222	25	350

Source: Oregon Department of Energy

Wind projects in various phases of development should maintain short-term employment in numerous construction and development jobs, thus allow for growth in permanent operation and maintenance positions. The 19 wind farms in various stages of planning and development have the potential to add over 4,300 megawatts of capacity to Oregon. Preliminary records filed by the nine facilities subject to EFSC jurisdiction indicate a potential increase of 182-221 permanent positions and approximately 2,600 construction positions (See Table 2).

²² Estimates can vary in part based on facility specific characteristics such as wind turbine manufacturer and turbine type.

²³ Renewable Energy Industry Needs Assessment. South Central Workforce Council, Western Wind Power, and Columbia Gorge Community College. December 2009.

²⁴ Employment estimates provided to EFSC can be found in each facility's final order located at <http://www.oregon.gov/ENERGY/SITING/certificates.shtml>.

²⁵ For a description of facilities under EFSC jurisdiction, visit <http://www.oregon.gov/ENERGY/SITING/juris.shtml>.

²⁶ Information provided to EFSC represents estimates provided by the project developer and are not verified by the Department. These estimates are for jobs, not full-time equivalent (FTE).

Table 3. Potential Growth in Wind Energy Employment

Facility Name	County	Year Generation Commenced	Capacity (MW)	Permanent Jobs	Construction Jobs
Antelope Ridge	Union	Construction	300	8-15	200
Baseline	Gilliam	Planning	500	12-15	250
Golden Hills	Sherman	Approved	400	10-15	175
Helix Energy	Umatilla	Approved	102	6-10	120
Leaning Juniper	Gilliam	Construction	277	30	335
Montague	Gilliam	Approved	404	30	475
Rock Creek	Gilliam	Planning	550	20-40	250
Saddle Butte	Gilliam/Morrow	Planning	564	25	250
Shepherds Flat	Gilliam/Morrow	Construction	845	25	250

Source: Oregon Department of Energy

Case Study: Biglow Canyon

Biglow Canyon, located in Sherman County, Oregon in, is one of Oregon’s largest wind farms. The project, owned by Portland General Electric (PGE), consists of 217 wind turbines with a peak generating capacity of approximately 450 megawatts. Biglow Canyon was constructed in three separate phases with the first phase beginning construction in April 2007; the third and final phase began operation in June 2010. PGE estimates the actual generation from Biglow Canyon will be enough to provide electricity to about 125,000 homes, helping PGE meet its Oregon RPS requirements.

According to PGE, each construction phase of the Biglow project averaged 200,000 person hours with approximately 120 people working on site during the peak of construction. PGE notes that the 200,000



person hour estimate does not account for individuals who worked on the project but perhaps were not reported to the project developer. Non-recorded positions include individuals who worked on geological and archaeological issues, wildlife assessments, fallers, gravel and cement supply.

It is important to highlight the discrepancy between numbers provided here by PGE and the employment numbers provided in Table 2 above. The discrepancy represents different ways employment can be measured. To EFSC,

PGE provided job creation estimates based on the number of jobs whereas the numbers provided to ODOE staff for this report are estimates for person hours. The estimate in Table 2 includes positions listed above, not reported to the project developer.

The project provides an example of the nature of the renewable energy job market. Initially developers employ a small number of individuals for planning and development, followed by an influx of a larger manufacturing and construction workforce. Once the work is completed, fewer employees are retained for ongoing operation and maintenance needs. In contrast, hiring individuals for biomass projects is ongoing and spurred by fuel collection and transportation demand.

Energy Trust of Oregon Induced Job Growth

In addition to establishing the Oregon RPS, SB 838 extended funding for the Energy Trust of Oregon (ETO). ETO is an independent nonprofit organization funded through a public purpose charge on customers who receive utility services from investor-owned Oregon gas and electric utilities. ETO's core mission is to: help Oregonians served by Oregon's investor owned utilities, invest in energy efficiency measures and support the development of renewable sources of energy. ETO funds smaller projects, however, it has helped support the development of large utility owned projects such as the Biglow Canyon Wind Farm.

Extending funding for the ETO through January 1, 2026, has helped to spur growth in the renewable energy, energy efficiency and conservation sectors. Because the ETO supports small projects, the long-term effects on the renewable energy sector will be much less than that of the RPS effects. The near-term impacts are skewed towards the ETO because the smaller projects can be implemented more quickly. In 2010, ETO expenditures and energy saving measures generated \$55.8 million in wages, \$14.8 million in small business owner income; and 1,234 full- and part-time jobs.

ECONorthwest, an economic consulting firm, estimated the economic effects of ETO's energy efficiency and renewable energy programs in 2007. ECONorthwest concluded that total ETO spending of \$9.9 million created 390 new full and part-time jobs and stimulated an increase of \$16.5 million in wages²⁷. Of the \$9.9 million spent on renewable energy, \$6 million was provided as incentives to the Biglow Canyon wind project that began operating in December 2007. ECONorthwest estimates the Biglow Canyon project generated \$18.3 million in wages; 460 full- and part-time jobs. The ETO is currently working with ECONorthwest to conduct an up-to-date review of the economic value of ETO programs and spending.

Renewable Manufacturing and Operations

Efforts to build new renewable generation facilities also result in indirect and induced jobs created through support industries such as equipment manufacturers, product sales, operations and jobs that offer services to these new workers.

One example is the renewable manufacturing industry. The rate of growth in this industry along with state incentives has encouraged several renewable energy manufacturers to locate facilities in Oregon. In January 2011 Business Oregon conducted an analysis using IMPLAN to estimate the number of jobs

²⁷ *Economic Impacts from Energy Trust of Oregon 2007 Program Activities*. ECONorthwest. August 2008. ECONorthwest used a methodology that considers these jobs net new jobs, that is every job created is in addition to the number of jobs created had the money spent on this project been returned to ratepayers.

created from renewable energy manufacturing projects that had applied for an Oregon Business Energy Tax Credit (BETC), and had been completed, received pre-certification, or were still pending. Business Oregon’s analysis revealed that \$215.6 million in manufacturing BETC credits planned for qualifying businesses will result in \$774 million in total capital investment, 1,840 direct manufacturing jobs, and nearly 7,000 indirect and induced jobs for Oregon. It is expected that these jobs will create a total annual payroll of more than \$610 million.

Oregon also has two large energy sales and marketing companies—Vestas and Iberdrola Renewables—and both are headquartered in Portland, Oregon. Vestas is one of the world’s largest manufacturers of wind turbines, employs 400 staff at the headquarters office and about 30 staff in rural areas throughout the state that manage Vestas wind turbines. Iberdrola’s Portland headquarters is home to 470 permanent staff who manage the North American operations; this includes 79 contract positions.

Wages and Benefits

Respondents to ODOE’s 2011 survey of RPS eligible generators provided salary ranges, which varies among facility owners. All employers provide regular employees paid health and retirement benefits.

Table 4: Salary Ranges at Certain RPS Eligible Facilities

General Job Classification	Salary Range
Administration	\$30,000 - 70,000
Managerial	\$50,000 - 125,000
Operations and Maintenance	\$30,000 - 65,000

Source: Oregon Department of Energy

The Oregon Employment Department’s 2008 report—*The Greening of Oregon’s Workforce*—offers an overview of wages in the renewable energy sector. The report found that pay for green jobs is generally slightly higher than other sector employment; the average green job wage is \$22.61 per hour. While limitations imposed by current occupational tracking systems hamper the ability to specifically identify renewable sector positions, OED did estimate wages for solar panel installers and wind turbine technicians. The estimation was based on standard occupational classifications for positions that included solar panel installers and wind turbine technicians (see Table 5).

Table 5: Occupations That Include Solar Panel Installers and Wind Turbine Technicians

Standard Occupation Classification	Average Hourly Wage
Electricians	\$24.58
Installation, Maintenance, and Repair Workers, All Other	\$21.60
Plumbers, Pipefitters, and Steamfitters	\$25.83
Engineers, All Other	\$30.87

Source: Oregon Employment Department, *The Greening of Oregon’s Workforce*

Training Opportunities

Oregon's universities, community colleges, apprenticeship programs, and business community are offering training programs in response to the market demand for green jobs.

Specific training programs that meet Oregon's needs for a trained renewable energy workforce are described below. See Appendix A for a list of existing renewable energy training programs.

The Green Jobs Council

The Oregon legislature has made creating a well-trained workforce a priority to meet the growing demand for green jobs. In 2009, the legislature tasked the Oregon Workforce Investment Board (OWIB) with developing a *Green Jobs Growth Plan*. To that end, the Green Jobs Council was convened to oversee the development and implementation of the plan. Since 2009, the Green Jobs Council has been working with stakeholders to assess the green sector, which includes occupations in energy efficiency and renewable generation and manufacturing and develop a strategy for developing green jobs training opportunities. In January 2010, OWIB received \$5.38 million in State Energy Sector Partnership (SESP) grant funding from the U.S. Department of Labor to invest in green jobs training. The Green Jobs Council oversees the SESP funds in partnership with Oregon's community colleges and universities to develop training programs. While several of the programs listed in the table in Appendix A are part of this effort, SESP funds continue to be distributed. One of the sectors being targeted is the renewable energy sector.

Wind Turbine Blade Repair

Miles Fiberglass and Composition provides an array of services that meet customer demands for fiberglass and composite products. Upon seeing the market opportunity providing services to the rapidly growing wind industry, Miles Fiberglass responded with the creation of an entire division dedicated to providing for the repair of wind turbine blades. In 2007 Miles Fiberglass employed 60 technicians for one wind turbine company.



Recently, Miles Fiberglass and Composition, Clackamas Community College and the American Composites and Manufacturing Association partnered on developing a training program for careers in this field. The program was piloted in the fall of 2010. This program offers an example of how industry and Oregon's institutions are uniting to try and meet market demand for a trained workforce in the renewable sector.

Solar Training

Treasure Valley Community College (TVCC) is working to establish the college as a training ground for individuals seeking work in the solar energy field. TVCC already offers a one year Certificate in Green Technology and is developing a two-year degree to train students in solar panel installation and maintenance.

TVCC is capitalizing on the recent construction of a new Oregon National Guard armory adjacent to the school's campus, which is home to a large new solar array capable of producing more than 100 KWh of energy. The solar array will serve as a training ground for students enrolled in TVCC's solar programs. These training centers like TVCC also create new jobs for instructors and staff needed to maintain their programs.

IV. Future Analysis

Recent Adjustments

Since ODOE has expanded its data collection to include the measurement of the economic impact of agency efforts, programs have begun to collect data relating to employment. In 2010 the BETC program began collecting employment related data from projects receiving BETC support. In addition, the RPS program administrator is revising current application procedures to include requests for employment related data from all projects requesting Oregon RPS certification.

Next Steps

Interagency and Stakeholder Cooperation

Multiple agencies, private businesses, and non-governmental organizations have engaged in conducting economic assessments of the green economy. In order to leverage resources and maximize efficiency, ODOE must continue to build mutually beneficial relationships with the Oregon Employment Department, the Oregon Workforce Investment Board, the Green Jobs Council, the Energy Trust of Oregon, Business Oregon, the state's utilities, and others in order to effectively measure and assess the impact of Oregon's green initiatives. Improved coordination saves resources but also maximizes the strengths of each agency. The results would improve the quality of information being received and provide stakeholders and the public with clearer information on the green economy.

In the past ODOE coordinated the Renewable Energy Working Group (REWG), a stakeholder group focused on developing detailed solutions to Oregon's renewable energy issues. Since there are still renewable energy questions and program assessments needed, groups such as the REWG can help with future impact study coordination, as well as technical challenges. In addition, such a forum provides a natural venue for identifying areas for future policy improvement and energy sector collaboration.

Economic Analysis

Current efforts to improve agency data collection related to employment measures will produce more thorough estimates of renewable sector employment. One limitation of this assessment is its inability to estimate indirect and induced employment impacts of renewable generation projects, as well as its inability to discern the impact of the Oregon RPS from other state, regional, and federal programs and incentives.

Once the RPS has experienced several years of compliance it would be useful to conduct an analysis that identifies indirect and induced effects of the program and distinguishes the impact of the RPS from other state, regional, and federal incentive and regulatory programs. Doing so would allow regulators, lawmakers, and stakeholders to identify strengths of the program and areas of opportunities, enhancing the impact on renewable energy sector growth in Oregon in the coming years.

APPENDIX A.

Summary of Oregon Renewable Energy Training Programs

Table 6: University and Community College Training Programs²⁸

School	Program	Degree	Training Applications
Central Oregon Community College	Basic Solar PV Design & Installation	Training	Photovoltaic design and installation concepts
Central Oregon Community College	NABCEP Entry Level Solar PV Exam Prep for Electricians	Training	16-hour course for licensed electricians to prepare for the NABCEP Solar PV Entry Level Knowledge Exam
Clatsop Community College	Sustainable Energy Technician	2-years AAS	Focus on energy conservation and renewable energy production
Columbia Gorge Community College	Renewable Energy Technology	1-year certificate: Renewable Energy Technology	Hydro-generation, wind-generation, & automated manufacturing
Columbia Gorge Community College	Renewable Energy Technology	2-years AAS: Renewable Energy Technology	Hydro-generation, wind-generation, & automated manufacturing
Clackamas Community College	Renewable Energy Manufacturing	AAS and 1-year Certificate	Careers in manufacturing of renewable energy technology
Clackamas Community College	Wind Blade Repair ²⁹	Training	Wind turbine blade repair
Lane Community College	Renewable Energy Technician	2 year AAS – Renewable Energy Technician	Designing and installing solar electric and domestic hot water systems
Lane Community College	Northwest Energy Education Institute	Energy Management Certification	Advanced energy management principles and techniques
Marylhurst University	Sustainable Business Renewable Energy	MBA	
Oregon Institute of Technology	Renewable Energy Systems	BS in Renewable Energy Systems	Management design and installation of renewable energy systems
Oregon State University	Energy Engineering Management	Bachelor of Science	Coming fall 2011

²⁸ Much of the information in this table was supplied in 3E Strategies report, *An Inventory of Renewable and Efficient Energy in Oregon*.

²⁹ Program was piloted during fall 2010.

Portland Community College	Renewable Energy Systems	AAS in Engineering Technology; Solar or Fuel Cell	Solar installation and maintenance or fuel cell development
Portland Community College	Renewable Energy Systems	AAS in Wind or Hydro Engineering Technology	Hydro-generation or wind-generation
Treasure Valley Community College	Solar Program in Design	AAS Certified Solar System Installers	Solar installations and maintenance
Treasure Valley Community College	Renewable Energy Technology	1-year Certificate: Renewable Energy Technology	

Table 7: Union Apprenticeship and Industry Programs³⁰

Sponsor	Program	Degree	Training Applications
National Electrical Contractors Association (NECA) and International Brotherhood of Electrical Workers (IBEW)	Training Center	Electrical License	Inside Electrician
Central Electrical Training Center	Training Center	Electrical License	Inside Electrician
Northwest Line Construction Industry Joint Apprenticeship Training Committee (JATC)	Training Center	Electrical License	Lineman
Pacific NW Ironworkers & Employers Apprenticeship	Training Center		Ironworker: Wind and Turbine Maintenance
Renewable Energy Joint Apprenticeship Training Committee/OSEIA	Training Program		Solar Installer
Renewable Energy Joint Apprenticeship Training Committee/OSEIA	Training Program		Renewable Energy Technician
Vestas Business Academy	Training Program	In-house training program	Installation, commissioning, and servicing of wind turbines

³⁰ The above training centers have indicated to the Oregon Bureau of Labor and Industries that they have a green, renewable or energy efficiency component to their programs.